



# ORIGINAL SPECIFICATION - AMENDMENT A MARKINGS

## INERTIAL OSCILLATOR CONTROL SYSTEM

### ABSTRACT

(put at end)

- 1 This invention relates to a mechanical oscillator control system yielding a  
2 force output for lifting a gravity payload. The oscillator system consists of an  
3 unbalanced inertial rotor or rotors constrained to orbit while undergoing strong  
4 radial motions. The rotor is rotateably connected to a moveable platform via a  
5 planetary gear orbiting about a fixed sun gear of equal size. The resulting oscil-  
6 lator generates strong coriolis forces that combine as compound forces with the  
7 centrifugal forces to generate a net alternating force on the platform. These forces  
8 are then coupled to a gravity payload via a mechanical clutch acting when the forces  
9 are upward, with platform re-positioning using a crank-spring mechanism. The load  
10 is lifted, and by gimbal vectoring, lateral motion is also achieved.
- 11 This application was originally filed as a provisional application on June 22, 2000 and  
12 had an application number 60/213,449.

ORIGINAL SPEC

## Background:

0 Various inventors have attempted to harness the forces of a rotating unbalanced mass in a  
1 mechanical oscillator. Dean, in his two patents US2886976 and 3182517 show counter-  
2 rotating masses in a carriage with forces transmitted to the frame by intermittent coupling of  
3 several kinds. In the first case, the patents use electromagnetic clutches acting on a tape  
4 attached to the load to be moved as well as solenoids to reposition the carriage. In the second  
5 case, rotating cams are used for both positioning and obstructing the pathway of the slide  
6 member. Output forces are obtained in each cycle of rotation, whereas in the case of Srogi,  
7 US4242918 the shuttle is retrieved after 10 cycles using a ratchet/pawl mechanism and return  
8 mechanism. Finally, in the case of Laul, US5966986, the unbalanced weights move into a guide ch  
9 which imparts the forces then the carriage plate moves back hitting the rear stop. All of the  
10 above devices use eccentric rotors having a fixed radius from their axles of rotation, and pre-  
11 sumably the propulsion operates in any direction.

## 12 Theory of Operation

13 Newton's Laws of Motion apply to any inertial frame of reference which is either stationary  
14 or moving at a uniform speed. In a rotating frame of reference, additional forces appear such  
15 as the coriolis force, due to radial motion of the mass and which acts perpendicular to the radius  
16 vector from the orbiting mass to the instant center of rotation. Centrifugal force acts outwardly  
17 as customarily occurs in uniform rotation about a fixed axis. If the rotation occurs with constant  
18 angular velocity (enforced by use of a flywheel), other forces such as angular accelerations and  
19 tangential accelerations can be ignored. Finally, radial acceler-  
20 ations are also neglected. Thus, the net force acting on the mass is the vector sum of just the ~~centr~~

1 centrifugal and coriolis forces. It has been found experimentally, that when a mechanical oscill  
2 tor is designed such that the coriolis <sup>force</sup> is of a magnitude comparable to the centrifugal forces, a  
3 non-newtonian phase angle arises causing an unbalanced force to momentarily arise, which  
4 accelerates the C.G. of the oscillator. Many studies of different coriolis inertial oscillators have  
5 confirmed this effect. The preferred embodiment shown herein is that of a planetary oscillator  
6 involving a satellite rotor orbiting about a planet gear, which in turn revolves about a fixed sun  
7 gear. <sup>CAUSING MOTION INTO A SPIRAL TRAJECTORY,</sup> Net forces acting on the moveable platform are just the sum of the coriolis and centri-  
8 fugal forces. If the platform is then coupled to the frame and payload, with the direction of  
9 platform motion being vertical in the gravitational field of the planet, and said coupling occurring  
10 at a time increment when the platform is undergoing upward acceleration, a vertical thrust  
11 occurs that lifts the payload. The weight of the payload restricts the amplitude of oscillation  
12 of the platform, and its kinetic energy is converted into work on the payload (weight times the  
13 lift height). The motor restores the energy lost to the lifting of the payload via the flywheel and  
14 splined shaft/worm gear arrangement. After 90 degrees of rotation of the planet gear, the  
15 platform is decoupled and free to oscillate and free fall without affecting the frame and its load.  
16 The gravitational "weight" of the payload is one-directional (i.e., always downward) in the frame  
17 , of the earth, and thus the restriction of the inertial oscillator is also one-directional yielding  
18 a one-directional lifting impulse on the payload. In the reverse direction, the oscillator is in free  
19 fall downward and thus no downward force acts on the payload from the action of the rotor.  
20 Figure Drawings Description:  
21 Figure 1. is a frontal view of the invention showing the planetary oscillator mounted on the

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*new TP 2*

- 1 moveable platform via rollers in a frame attached to a heavy payload. Figure ~~1a~~ shows
- 2 the trajectory of the satellite rotor mass.
- 3 Figure ~~1~~ is a rear view the inertial oscillator control system with the clutch and repositioning
- 4 controls as well as the splined drive shaft and slideable worm gear assembly with spring-crank
- 5 positioning device. (Figure ~~2a~~ shows an alternate method of driving the planetary rotor from
- 6 a fixed motor using an Oldham coupler.)
- 7 Figure ~~2~~ shows a multiple unit arrangement of planetary oscillators arranged vertically but in a
- 8 frame which is gimbal mounted to the gravity payload and thus can be vectored off from
- 9 the vertical to generate lateral thrust components.

*(Fig 5 ... )*

Objectives:

1 The primary objective of this invention is to generate vertical lifting forces in the gravity field  
2 of the earth. The invention builds upon prior art in the use of rotating unbalanced masses.  
3 The inertial coriolis oscillator has the correct properties of being an alternating force generator,  
4 which, with the disclosed control system, has the capacity for high speed operation. At the  
5 same time, speed regulation must occur through appropriate sizing of a lightweight, high  
6 revolving speed flywheel via clutch assembly. At least two oscillator units are required, clocked  
7 180 degrees ~~apart~~ to cancel transverse or lateral forces in a common rigid frame. Employment  
8 of a gravitational load with its asymmetrical properties (acting downward only) permits one-  
9 directional restriction of coriolis oscillator amplitude yielding vertical net impulses of thrust.  
10 Lastly, by gimbal mounting of the frame unit above the gravity payload, the frame can be  
11 vectored off from the vertical orientation to achieve horizontal motion of the gravity payload.  
12 Likewise, azimuthal rotation of this thrust vector permits directional control in the horizontal  
13 plane.

14 Detailed Description of Figures:

15 The generalized coriolis oscillator involves both radial motion of an orbiting mass with tangential  
16 velocities yielding compound forces on the mass. In the first embodiment shown in Figure 1, a  
17 planetary gear arrangement is ~~shown~~ <sup>5</sup> consisting of a fixed sun gear 30 attached to the moveable  
18 platform 20 free to oscillate vertical in gravity field of earth. The platform 20 is held rigidly in  
19 frame 10 via guide rollers or bearings 21. A planetary gear 35 revolves around the sun gear 30  
20 via arm 40 and bearing assembly with axle 31 passing through the platform for drive connection.  
21 Unbalanced rotor 50 is connected to the planet gear 35 with arm 51. The entire assembly is

Angular

CUR 1 then driven at constant ~~angular~~ speed of the planet gear 35 about the sun gear 30. The rotor 50  
AM  
2 tends to move at twice the speed of the planet gear 35. Generally, the spacing between the masses  
3 are made equal, but the rotor mass 50 can be made zero or very small as its effects due to its large  
CUR 4 radius and faster speed have strong effects on the platform motion. In Figure ~~2~~ 2, as taught by  
AM  
5 Thomson in US4631971, the rotor will move in a ~~hypocycloid~~ epicycloid path (clockwise) or trajectory in the fi  
e  
6 of reference of the platform. 20. In position I at the 12:00 o'clock or Top Dead Center position  
7 the rotor 50 points in the direction of thrust T at maximum radius and rotational speed. At position  
8 III the rotor 50 is centered on the sun gear 30 and is thus in a null position. As the rotor 50  
9 moves clockwise, its motion is outbound generating strong coriolis forces tending also in the  
10 clockwise direction. At position IV, the coriolis forces of the rotor 50 as well as the planet gear  
11 mass 35 point generally upward, creating, with vectorial addition of their centrifugal forces, the  
12 upward vertical thrust that lifts the system into the air (peaking at position I).

next - 13 In Figure ~~7~~ 3, the rear view of the invention is shown with details of the control system for  
END  
14 coupling and positioning the oscillator to the frame 10. The planet gear 35 is driven via axle  
15 31 connected to worm gear 32 driven by helical worm 36 slideably mounted on spline shaft 102.  
16 The spine shaft 102 is connected to the clutch assembly 90, which engages the flywheel 80 and  
such as an AC induction or DC electric type.  
17 motor 100. The worm 36 is mounted on the platform 20 via endplates not shown. And  
18 adjustable cam 34 attached to the worm gear 32 axle is clocked to engage the follower 64 on  
19 the arm of a toggle clamp 60 or other suitable mechanical clutching device. The toggle clamp 60  
20 grips a grooved load rod ~~member~~ 104 that is fixed to the frame 10 at the top and bottom. A backplate  
21 62 holds the rod 104 against the clamping force of the toggle adjustment bolt 65. The cam 34

1 is clocked to actuate the toggle clutch and thus engage the rod 104 when the upward acceleration  
2 of the platform 10 can lift the payload. At the end of this operation, not exceeding 90 degrees  
3 duration, <sup>of planet gear,</sup> the release pin 70 on the idler worm gear 33 is clocked to knock the toggle arm  
4 follower 64 thus releasing the toggle clutch. Also on the idler worm gear 33 is a crank pin 72  
5 with push rod 75 free to swivel at its top end about 72 pin. The compression spring 73 and  
6 adjustment sleeve 74 are set to push against the plate 76 attached to the frame 10 thru guide hole  
7 71 for the push rod 75. This positioning system exerts a upward spring pulse with a peak  
8 value when the crank is in the most downward position as shown. The effect of the crank-spring  
9 mechanism, is to restore, for each cycle of thrust, the elevational position of the oscillator in  
10 the frame and maintain it operationally. In Figure 3a, <sup>5</sup> ~~an oldham coupler is shown which can~~  
~~alternately be used to transmit torque to the rotor axle from a fixed motor and provide high~~  
12 ~~torque capacity and zero backlash.~~

13 In Figure 4, two units are shown each clocked 180 degrees apart in a common rigid frame  
14 with a gimbal truss 201 assembly on the bottom. The gimbal 201 is attached to a heavy payload. The  
15 the thrust assembly 204 may be vectored off from the vertical to generate horizontal thrust and  
16 lateral motion of the payload 300.

17 In operation, the thrust assembly 204 is vertically oriented with a heavy payload at the  
18 bottom. The motor is activated and the oscillator pair reciprocates up and down in the guide  
19 channel of the rigid frame 10. The spring crank mechanism maintains the location of the oscil-  
20 lators as the clutching system is activated by the cam 34. Pulses of thrust acting upward, and not  
21 exceeding 90 degrees of rotation of the planet gear 35 occur, and the payload is lifted off the

## INSERT A

"In FIG. 5 an embodiment is shown using an oldham coupler 69 which can alternately be used to transmit torque to the rotor 50 axle from a fixed motor and provide high torque capacity and zero backlash. Here the satellite mass is zero, and the planet rotor 50 revolves where the sun gear would be. This configuration can offer multiple oscillators with at least two coaxially coupled by a common oldham coupler, each being clocked 180 degrees apart on independent platforms 20 all driven by the motor oldham. Also, the spring-crank repositioning device 75 is driven by a chain drive and sprocket arrangement off a sprocket 82 of equal size rotatably connected to the oldham. For this heavy duty application, the mechanical clutch is a cam buckle 83 acting on a nylon webbing material member 84. Here, the flywheel is replaced with a mechanical governor 81 to maintain constant speed. Finally, the motor 101 can be a rotary wankel engine."



1 / ground. The amplitude of the platform is restricted and energy lessened. In the remaining 270  
2 degrees, the oscillator is in free fall, and energy is restored to the rotors via the motor and  
3 spine shaft arrangement. Just before the start of clutching in the next cycle, the spring-crank  
4 restores the elevation position. This step engenders only a negligible amount of downward  
5 "recoil" force since the rotors have withdrawn to a much lower radius ~~during this~~ <sup>from the</sup> backstroke.  
6 The system may thus have application as in a warehouse for lifting heavy pallets or other stored  
7 material, reducing the friction with the floor, and with the lateral vectoring process, move the  
8 heavy load to the desired point.

The system is referred to  
as the Gravito-Inertial Lift System  
or GILS.

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